An Investigation of Turbine Stages with Long Blades of Constant Profile under Variable Conditions

conditions and in the presence of a working wheel are given in Fig 3c. It will be seen that the static pressure field is very irregular. Graphs of the reaction at root and tip sections as a function of the velocity ratio are given in Fig 4. It will be seen that in most cases the reaction is negative at the blade roots. These tests were made in the absence of diaphragm leakage. The presence of negative reaction at the blade roots has no appreciable influence on the stage efficiency. The curves of distribution of reaction over the radius for stages KD-2-2A and KD-2-3A at various values of velocity ratio and constant pressure ratio are given in Fig 5. The curves were constructed from experimental values of the loss factors at different sections of the guide vanes and reaction in the root section, using formula (2). It will be seen that the agreement between the experimental and calculated values of reaction is satisfactory. Graphs of the relative difference of root and tip reaction as a function of the relative change in the velocity ratio are given in Fig 6. Over the range

SOV/96-59-6-2/22

An Investigation of Turbine Stages with Long Blades of Constant Profile under Variable Conditions

of change of velocity ratio from - 0.2 to + 0.2 this relationship is given by formula (3). It was found that there is a certain range of Reynolds and Mach numbers and of diaphragm leakage for which formula (3) remains valid, as will be seen from the results plotted in Fig 6. Formula (3) can serve as a basis for two methods of designing stages with long blades operating under variable conditions, as is briefly explained. The influence of Reynolds number on the stage efficiency is then considered. A series of tests was made on the three stages. The influence of the Reynolds number was thereby evaluated in stages having different degrees of reaction at the root and middle sections. The test results, plotted in Fig 7, are discussed at some length. It is found that the influence of the Reynolds number is greatest when the velocity ratio is high. Graphs of the relationship between the maximum stage efficiency and the Reynolds number appear in Fig 8, and graphs showing the influence of the Reynolds number on the reaction at the root and tip sections of the three stages are plotted in

Card 5/8

SOV/96-59-6-2/22

An Investigation of Turbine Stages with Long Blades of Constant Profile under Variable Conditions

Fig 9. Graphs of the flow coefficients as a function of Reynolds number are plotted in Fig 10. The influence of diaphragm and leakage is then considered. In order to determine the influence of diaphragm leakage on the stage characteristics, steam was delivered from the steam chest to the space between the disc and diaphragm in amounts up to 5% of the main flow. Graphs of the changes in efficiency as functions of leakage are plotted in Fig 11. Graphs of tip and root reaction, and flow coefficient as function of velocity ratio and a graph of the influence of leakage on the change in stage reaction, are plotted in Figs 12a and 12b respectively. It is found that increase in Reynolds number and decrease in leakage reduces both root and tip reaction. The results of a detailed study of the flow structure in stage KD-2-2A are discussed. The main conclusions are that the ratio of the flow area of the working blades to that of the guide vanes has a considerable influence on stage efficiency. Alterations of the blade root reaction from + 5% to zero had little influence on the stage efficiency. The presence of low negative reaction

Card 6/8

SOV/96-59-6-2/22

An Investigation of Turbine Stages with Long Blades of Constant Profile under Variable Conditions

caused some reduction in stage efficiency. With increase in the compressibility (Mach number) the efficiency first rises and then falls. The optimum value of the Mach number depends on the stage geometry and particularly on the area ratio and the type of blades used. As the Mach number increases, so does the reaction. Detailed investigation of the flow structure showed that alteration of the area ratio alters the losses in the working blades and the discharge velocity loss. The flow was found to be very uneven at the outlet section of the guide vanes. It was established that over a certain range of Mach numbers, rotation of the runner has no important influence on the velocity distribution over the pitch of the guide vanes. It follows from this that stage calculations based on static steam tests on full-scale diaphragms are

Card 7/8

SOV/96-59-6-2/22

An Investigation of Turbine Stages with Long Blades of Constant Profile under Variable Conditions

reliable provided that the Mach and Reynolds numbers are equal in the actual and model conditions.
There are 12 figures, 2 tables and 5 Soviet references.

ASSOCIATION: Moskovskiy energeticheskiy institut
(Moscow Power Institute)

Card 8/8

APPROVED FOR RELEASE: 06/12/2000 CIA-RDP86-00513R000410310015-6"

DEYCH, M.Ye., doktor tekhn.nauk; TROYANOVSKIY, B.M., kand.tekhn.nauk
KAZINTSEV, F.V., inzh.; ABRAMOV, V.I., inzh.

Investigating a series of single-row stages. Teploenergetika 6 no.4:
38-43 Ap '59. (MIRA 12:3)

1. Moskovskiy energeticheskiy institut.
(Steam turbines)

SOV/96-59-7-23/26

AUTHORS: Deych, M.E., Doctor of Technical Sciences and
B.M. Troyanovskiy, Candidate of Technical Sciences

TITLE: Letter to the Editor (Pis'mo v redaktsiyu)

PERIODICAL: Teploenergetika, 1959, Nr 7, pp 94-95 (USSR)

ABSTRACT: This note is in reply to a criticism by Kachuriner that the efficiencies of the new Moscow Power Institute turbine blading are not as high as is claimed. The discussion centres around the methods of testing turbine stages. There is 1 figure.

Card 1/1

10.2000, 10.3000

SOV/96-59-11-14/22

AUTHORS: Deych, M. Ye., Doctor of Technical Sciences, Zaryankin, A. Ye., and Sherstyuk, A. N., Candidates of Technical Sciences

TITLE: New Designs of Nozzle Blading for Supersonic Speeds

PERIODICAL: Teploenergetika, 1959, Nr 11, pp 65-68 (USSR)

ABSTRACT: There is a need for high-efficiency nozzle blading for supersonic speeds. Expanding nozzle blade profiles developed in recent years are of high efficiency under designed operating conditions, but the efficiency falls off rapidly when the conditions are changed. This will be seen from curve 1 of Fig 1 which gives profile losses as function of Mach number for expanding nozzles type TS-2V. At the design condition of Mach 1.6 the losses are only 10%, but at Mach 1 they become 31%. Normal nozzles with contracting channels work well only at moderate supersonic speeds; see, for example, curve 4 in Fig 1. Methods of reducing the losses at supersonic pressure-drops may be evolved from the formulae for the change of direction of flow in the skew section of the nozzles. To this end sections before and after the nozzle are considered, as shown in Fig 2. The equations of continuity, conservation of energy and

Card 1/4

4

66570
SOV/96-59-11-14/22

New Designs of Nozzle Blading for Supersonic Speeds

condition are applied to these two sections and formula (1) is derived for the relationship between the flow conditions before and after the blading. From this formula it is easy to determine the change of direction of flow in the skew section of the nozzle at supersonic pressure drops, and formula (2) accordingly is derived. If an experimental relationship between the velocity ratio and pressure ratio is used, formula (2) is very accurate. The accuracy is evident from Fig 3, where experimental values are compared with values calculated by formula (2). It has been shown that in nozzles with expanding channels, for example those of the Moscow Power Institute, the mean angle of discharge does not depend much on the operating conditions. For this case formula (2) may be used to determine the relationship between the velocity coefficient and the pressure ratio, as seen in Eq (3). The comparison of theoretical and experimental results given in Fig 4 confirms the good agreement. This agreement was obtained without detailed analysis of the nature of flow in the blading. Hence,

Card 2/4

New Designs of Nozzle Blading for Supersonic Speeds

if the blading is made in such a way that the discharge angle does not depend on the operating conditions, then the losses must inevitably rise when the Mach number is decreased. In this case the losses depend only on the loss under design conditions of operation and on the pressure ratio. This conclusion served as a criterion of blade shape for supersonic pressure-drops. The blade shapes should ensure variable discharge angle on change of pressure-ratio and, therefore, the discharge portion of the rear of the blade should be slightly bent so as to increase the discharge area. Such blade profiles differ from ordinary nozzle blades with contracting channels only in the shape of the back face of the blades. A group of new blade profiles that meet this requirement are shown in Figs 5 and 6. Loss as a function of Mach number for the new profile TS-2RV is plotted in curves 2 and 3 in Fig 1. It will be seen that for blading of similar efficiency at 1.5 the new blading has much lower losses at lower Mach numbers. Blade shape TS-1RV is recommended for nozzles where the Mach number is 1.3 and blade shape TS-2RV when the Mach number is 1.5. Blades with backs of the new shape should

66570
SOV/96-59-11-14/22

New Designs of Nozzle Blading for Supersonic Speeds

be used for guide vanes and working blading in stages with long blades, and in particular for the last stages of condensing turbines which operate at high supercritical heat-drops. In the root section of such stages, the velocity at the outlet from the guide vanes is, as a rule, appreciably higher than the speed of sound. The discharge angle from runner blades is also supersonic near the periphery. As the last stages may operate under very variable conditions, both guide vanes and runner blades should have a curved back in the skew section. There are 6 figures, 2 tables, and 2 Soviet references.

ASSOCIATION: Moskovskiy energeticheskiy institut (The Moscow Power Institute)

Card 4/4

SOV/96-60-2-3/24

AUTHORS: Deych, M. Ye., Doctor of Technical Sciences, Zaryankin, A. Ye., Candidate of Technical Sciences, Filippov, G.A., and Zatsepin, M. F., Engineers

TITLE: Methods of Increasing the Efficiency of Turbine Stages with Short Blades

PERIODICAL: Teploenergetika, 1960, Nr 2, pp 18-24 (USSR)

ABSTRACT: The efficiency of the high-pressure parts of large turbines having fixed and runner blades of improved profiles and provided with good internal glands and seals reaches 78 to 80%. Further improvements in profiling are not likely to give much better efficiency, as modern blades already have very low profile-losses. However, the efficiency of intermediate high-pressure stages can be appreciably increased by special profiling of the fixed blades in the meridional plane and by using runner blades with diffuser channels. Meridianal profiling is now being developed to give stages of constant reaction. In high-pressure stages this problem is best solved by trying to reduce the end losses. In order to reduce the end losses in fixed blades, it is necessary to reduce the velocity on sections of maximum

Card 1/6

Methods of Increasing the Efficiency of Turbine Stages with Short Blades

channel curvature where secondary flows are most marked. This ensures turbulent flow and so reduces the thickness of boundary layers on the backs of the blading and on the upper and lower walls of the channel. This is accomplished by profiling the channels along their height (profiling in the meridional plane). The profiling may be symmetrical with straight or curved faces, or asymmetrical with straight or curved generating lines. Asymmetrical profiling makes it possible both to reduce the end losses and to reduce the radial pressure gradient. The present article gives test results on blading with asymmetrical profiling over the height, both with the blades mounted in straight rows and on rotors. Fig 1 gives graphs of the loss distribution over the height of a straight row of blades with different shapes of the upper rim. It will be seen that the best results are obtained with asymmetrical profiling beyond the position where the curvature of the channel is greatest. The reduction in fixed-blade losses by the use of asymmetrical profiling is explained by reference to the graph of pressure distribution across the profile given in Fig 2. It is also pointed out that in the blading with asymmetrical profiling the point of minimum pressure is displaced somewhat in the direction of flow. Hence the length of the turbulent section and the pressure gradients in it are somewhat reduced. This has the effect of reducing the profile losses. The loss-coefficient curves plotted in Fig 3 clearly show the advantages of blades with asymmetrical profiling over the height, particularly for short blading. The effect of this special profiling is greater when the blades are mounted on a rotor because the losses at the blade roots are particularly reduced, thereby helping to equalise the velocity distribution. The best shape of profiling is then considered. Graphs of loss reduction as a function of profiling compression, plotted in Fig 4, indicate that the optimum amount of compression depends on the blade length. The shape of the compression curve may be based on calculation of the flow potential in the channel. A diagram of a profiled channel with three

SOV/96-60-2-3/24

Methods of Increasing the Efficiency of Turbine Stages with Short Blades

different degrees of compression is given in Fig 5, and calculated and experimental velocity distributions over a straight arrangement of blading caps TS-2A is given in Fig 6. It will be seen that agreement between theory and experiment is good. Tests on intermediate-stage fixed blades with diffuser inlets showed that under static conditions their use does not influence the effect of asymmetrical profiling over the height. Test results are plotted in Fig 7 and it is considered that the use of fixed blades with a complicated shape of outer rim increases the efficiency of intermediate stages with short blades. Further information about the use of fixed blades with asymmetrical profiling was obtained by testing groups of stages in the experimental steam turbine of the Moscow Power Institute. All stages have the same mean diameter of 400 mm; the other dimensions are tabulated. Tests were made on six stages of various blade lengths. Some were made with fixed blades profiled over the height and some with unprofiled blades. All the diaphragms were welded.

Card 4/6

SOV/96-60-2-3/24

Methods of Increasing the Efficiency of Turbine Stages with Short Blades

The tests covered a fairly wide range of velocity ratio and heat drop. The results, plotted in Fig 8, indicate that at optimum velocity ratio the stage with profiled blades has 2% higher efficiency with a blade length of 25 mm, and 3% higher with a length of 15 mm. The relative increase in efficiency by the use of asymmetrical profiling is 2.5% and 3.7 to 4% respectively. Asymmetrically-profiled blades continue to offer advantages when operation is not at the designed conditions, as is explained by reference to other curves on Fig 8. Important results were obtained on measuring the reaction in the blade root and tip sections. The use of asymmetrical profiling reduces the variations in static pressure distribution over the pitch in the sections. As will be seen from the graphs plotted in Fig 9 there was also a marked reduction in the difference between the reactions at the root and tip. The value of the outlet area of the guide vanes may be calculated from formula (1). An approximate method is given for calculating the asymmetrical profiling, using

Card 5/6

SOV/96-60-2-3/24

Methods of Increasing the Efficiency of Turbine Stages with Short Blades

Eq (2). It is concluded that asymmetrical profiling of the fixed blades across the height helps to give stages with constant reaction over the radius. In stages with very short blading any profiling of the channels over the height undertaken to reduce the difference in reaction should also be designed to reduce the end losses. The method of asymmetrical profiling that is proposed in this article solves these two problems. There are 9 figures, 1 table and 4 Soviet references.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Institute)

Card 6/6

87892

S/114/60/000/005/006/006
E194/E255

26.2120

AUTHORS: Deych, M.Ye., Doctor of Technical Sciences, Zaryankin, A. Ye., Candidate of Technical Sciences, Lebedev, A. Ye., Candidate of Technical Sciences and Frolov, L. B., Engineer

TITLE: An Instrument for Measuring the Torque, Speed and Power on High-Speed Turbines

PERIODICAL: Energomashinostroyeniye, 1960, No. 5, pp. 43-47

TEXT: In development work on blading very high speed experimental turbines are used, and the customary methods of measuring torque are often inapplicable. It is most convenient in such cases to measure torque in terms of the angular strain of the rotating shaft, but when the speed is of the order of 35 000 r.p.m. it is very difficult to take current from moving contacts on the rotor. An investigation of the operation of the various pickups carried out in the Moscow Power Engineering Institute showed that satisfactory results may be obtained with induction pickups, which are easily fitted to both experimental and regular production turbines. Impulses from these pickups can be used to measure both torque and speed. Two toothed magnetic

Card 1/4

87892

S/114/60/000/005/006/006
E194/E255

An Instrument for Measuring the Torque, Speed and Power on High-Speed Turbines

discs are fitted to the rotating shaft and as they turn they induce impulses in the pickups. When there is no strain and the shafts are not twisted, the pickups are arranged with a phase displacement of half the pitch of one of the teeth in the disc. As the machine is loaded and the shaft twists the phase relationship between the two series of impulses alters and is measured. The instrument has two shaping circuits, each containing an amplifier, a limiter, a differentiating circuit and an impulse generator. This shaper circuit serves to amplify the pickup signal and to convert it into a signal of standard shape with a steep wave-front. There is a comparator device that measures the phase relationship between the impulses. The same pickups are used for speed measurement. The output of the shaping circuits is applied to a trigger, which is a switching device controlling the charging and discharging of capacitors. The mean charging current of the capacitors is proportional to the speed. The reliability of the measurements depends on the construction of the

Card 2/4

87892
S/114/60/000/005/006/006
E194/E255

An Instrument for Measuring the Torque, Speed and Power on High-Speed Turbines

pickups. The pickup base is made of permalloy sheet 0.1 mm thick clamped between two diamagnetic holders; it carries a measuring coil of 100-500 turns. The output of the measuring coils has a saw-tooth wave-shape, the amplitude of which increases with the speed. A schematic circuit of the instrument is given and the various units, namely, the shaping unit, the torque measuring unit, the speed measuring unit and the power measuring unit are briefly described. An experimental rig for testing the device was set up. It consisted of a motor driving the shaft with toothed discs which in turn drove a generator, using special couplings. The arrangement was such that a calibration curve could be obtained of the instrument reading as a function of the pickup displacement, as plotted in Fig. 7. The graph shows a linear relationship between the instrument reading and the phase displacement. In measuring torque with an electronic dynamometer good results could be obtained by using torsion couplings, the design of which is briefly described. In preliminary tests the

87892
S/114/60/000/005/006/006
E194/E255

An Instrument for Measuring the Torque, Speed and Power on High-Speed Turbines

sensitivity was 100 microns displacement over the full scale, corresponding to a maximum angle of twist of 0.1°; however, the readings were not stable and depended on the speed of the disc. When the sensitivity was reduced to 0.5° of twist for full scale the readings were stable and independent of speeds. Good results can also be obtained using photo-electric pickups with the shafts rotating at any speed, including low speeds. In some cases the toothed wheels may be replaced by magnetic inserts of various kinds: the load on the flexible couplings of a turbine type ВК-100 (VK-100) can be measured in this way. By using the instrument on power station turbines feeding into a common system it is possible to investigate transient processes in the machines when the system load changes, and to obtain satisfactory data about the operation of the governor system. There are 8 figures and 3 references; 1 Soviet and 2 non-Soviet.

Card 4/4

86081

S/096/60/000/012/004/008
E194/E484

26.2120

AUTHORS: Deych, M.Ye., Doctor of Technical Sciences and
Gubarev, A.V., Candidate of Technical Sciences

TITLE: The Question of "Blocking" of the Delivery Nozzle and of the Working Blading Profile in a Supersonic Flow

PERIODICAL: Teploenergetika, 1960, No.12, pp.27-33

TEXT: In investigating turbine blading of the active type in a supersonic flow "blocking" of the nozzle occurred under certain conditions; like the similar effect in wind tunnels, it occurs because the flow capacity of the model under investigation is less than that of the nozzle. In a wind tunnel the zone of Mach numbers in which "blocking" is observed may be altered by changing the geometry of the working part of the tunnel but "blocking" in turbine blades depends only on the geometry of the nozzle and blading and the "blocking" zone cannot be altered without altering these. Accordingly, designers of turbine type machines must determine regions of "blocking" of blading and analyse the resulting effects. The application of the λ hodograph method to the analysis of "blocking" conditions is first considered,

Card 1/5

86081

S/096/60/000/012/004/008
E194/E484

The Question of "Blocking" of the Delivery Nozzle and of the Working Blading Profile in a Supersonic Flow

a description of the method is to be found in the book "Technical Gas Dynamics" by M.Ye.Deych. The continuity equation is written for the inlet and outlet sections of the blading in the form of Eq.(1). The equation may be used for graphical determination of the flow conditions in the blading by writing the axial projection of the referred flow through the blading in the form of Eq.(2) and (3). The hodograph of the vector may then be constructed which is a transcendental curve in a polar system of coordinates (λ, β). A typical hodograph is shown in Fig.2 and the circle corresponding to $\lambda = 1$ divides the plane of the hodograph into the two regions of subsonic and supersonic flows. The use of the λ hodograph method for calculation with subsonic speeds at inlet and outlet from the blading presents no difficulties. With supersonic discharge speed the inlet flow parameters cannot be arbitrarily selected because it is necessary to maintain the speed of sound in the minimum section of the channel between the blades. If this
Card 2/5

86081

S/096/60/000/012/004/008
E194/E484

The Question of "Blocking" of the Delivery Nozzle and of the Working Blading Profile in a Supersonic Flow

condition is fulfilled the hodograph method can be used without special difficulty for supersonic exit speeds from the blading. An example is then described with reference to Fig.2 given the inlet angle of flow to the blading β_1 and the dimensionless velocity λ_1. With supersonic speeds at inlet to the blading the analysis and calculation of the flow parameters beyond the blading is much more complicated. If the minimum section of the channel between the blades is assumed to occur at the exit the continuity equation for the characteristic sections may be written in the form of Eq.(4) and (5). It is then shown that supersonic flow at the inlet to the blading is theoretically possible only with an expanding nozzle under certain conditions. The occurrence of possible regions on the hodograph is discussed. The region of supersonic conditions in which "blocking" may occur is then considered. To simplify the analysis the case of an expanding nozzle and supersonic diffuser is considered, see Fig.3, in which

Card 3/5

86081

S/096/60/000/012/004/008
E194/E484

The Question of "Blocking" of the Delivery Nozzle and of the Working Blading Profile in a Supersonic Flow

the blading is replaced by an equivalent contracting channel. It is shown that supersonic speeds in front of the blading are only possible when Eq.(9) is fulfilled. For practical purposes it is recommended to construct the λ hodograph diagram in the form shown in Fig.4. The method of constructing and that of using the diagram are explained. The diagram may be used to determine the angle of deflection of flow in the guide vanes and runner blading. Calculated and experimental curves of the relationship between the discharge angle of the flow from the runner blading as function of the inlet angle and the speed of discharge are plotted in Fig.5. Analysis of the system is much more complicated when there is an axial gap between the guide nozzle and the blading but the method of calculation may still be used in this case providing that it is remembered that if the gap is big enough, the flow conditions of the nozzle depend only on the back-pressure and the conditions of flow at the inlet to the blading on the pressure drop and the loss coefficient in the nozzle. A special feature of gas flow in the
Card 4/5

86081

S/096/60/000/012/004/008
E194/E484

The Question of "Blocking" of the Delivery Nozzle and of the Working Blading Profile in a Supersonic Flow

nozzle blading system when there is an axial gap is that the blading reaction calculated from the flow parameters at the nozzle section and at the inlet to the blading are very different, see Fig.6. Serious errors may arise if the flow conditions in the blading are calculated from data relating to the nozzle discharge position. Special cases of blade "blocking" are then considered which may arise when the inlet angle of flow is other than that designed for. When the blading is moving relative to the nozzle, conditions under which blocking may occur are wider and the so-called condition of "partial blocking" is typical in this case for high supersonic speeds, this case is explained with reference to the vector diagram Fig.8. There are 8 figures and 5 Soviet references.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute)

Card 5/5

26.1000
10.3000

81811
S/096/60/000/08/011/024
E194/E484

AUTHORS: Deych, M.Ye., Doctor of Technical Sciences,
Zaryankin, A.Ye., Candidate of Technical Sciences,
Filippov, G.A. and Zatsepin, M.F., Engineers

TITLE: Increasing the Efficiency of Short Turbine Runner Blades

PERIODICAL: Teploenergetika, 1960, Nr 8, pp 51-56 (USSR)

ABSTRACT: Work published in Teploenergetika, 1956, Nr 6, and by Nippert in Germany in 1929 has shown that if the angle through which a flow turns in a channel is great and the static pressures at inlet and outlet are not very different, the losses due to secondary flow in curved ducts and in short blades are not minimum when the flow is steadily constricted. Nippert showed that when the flow is turned through a large angle, the use of expansion followed by constriction of the ducts between the blades greatly reduces the terminal losses. The theoretical problem is very complicated and it is best to determine the optimum velocity distribution by experiments. Tests were made on the Moscow Power Institute blading for subsonic speeds details of which are given in Table 1. These profiles are intended for

Card 1/6

81811

S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

short blades and were obtained by cutting back the concave surfaces in such a way that the channel between the blades first expands then contracts. The convex surface of the blade is left unaltered. Typical duct dimensions for blades shapes TR2A and TR-2Ak are shown in Fig 1. In the new blades the inlet section is greater than the outlet section and the maximum section at the middle of the blades is greater than the inlet section. With blades of this type, the variations in channel section are, of course, affected by the pitch and angle of installation of the blading. Tests were made with blades of various heights and various ratios of maximum inlet and discharge widths. The range of variation of the main geometrical characteristics for blades of group Ak are shown in Table 2. The tests were made in the wind tunnel of the Moscow Power Institute with nozzles ranging from 20 to 50 mm high. The advantages of an expanding and constricting channel for short blades was confirmed by experiment. Pressure diagrams for channels of

Card 2/6

81811
S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

different shapes with blade type TR-2A are shown in Fig 1. The results are discussed and it is concluded that there are three causes of the reduced terminal losses in blades with expanding and constricting channels, namely: the direction of the flow is altered at the lower mean speed; at the outlet section where secondary flows are intensified, the channel is constricted so that longitudinal pressure gradients are increased; in cross-section the length of the expanding section of the channel on the back of the blade is reduced as the point of minimum pressure is displaced in the direction of the flow. As will be seen from Fig 2, absolute values of loss factors in blades with channels of this type are reduced and, moreover, the distribution of losses over the height and pitch is more uniform. Graphs showing the relationship between the loss factor of the blading, the height and the angle of inlet are shown in Fig 3 for various kinds of blade. Curves showing the relationship between the loss factor, the ratio of the maximum to the inlet section and the

Card 3/6

4

81811

S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

height are shown in Fig 4; curves of the relationship between the loss factor, the pitch and the ratio of the maximum to the inlet section are shown in Fig 5. Optimum geometrical parameters for blades of group Ak are given in Table 3. It will be seen from Fig 5 and Table 3 that small variations in the ratio of the maximum to the inlet section do not appreciably affect the losses, the comparatively marked increase in losses at low relative pitch occurs because the channel is of less suitable shape. The influence of flow conditions on the efficiency of class Ak blading may be assessed from the graphs of Fig 6 and Fig 7. Fig 6 shows the influence of inlet angle: it will be seen that although the inlet losses do not vary much with inlet angle ranging from 25 to 35° the losses are less with blades Ak than with blades A. The influence of compressibility and Reynolds number on losses in the two types of blading is shown in Fig 7 and it is shown that compressibility does not have an appreciable

Card 4/6

81811
S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

influence on the losses up to Mach 1. Tests made with blades B and Bk are shown in Fig 7b and it will be seen that at slightly supersonic speeds the presence of an expanding section beyond the inlet has a favourable effect on the losses. It is concluded that in blades where the flow is turned through large angles, the terminal losses may be appreciably reduced by using blades group Ak and Bk with expanding and constricting channels. The simplest way of making these blades is to cut back the concave surfaces of blades A and B which are widely used in turbines. The best amount of expansion of the inlet section depends mainly on the angle through which the flow is turned and the relative height of the blading. Blading of the type described should be used with relative heights less than 2 to 3 and when the flow is turned through angles greater than 120 to 125°. The use of these blades together with guide vanes type Am (having asymmetrical meridional profile) gives appreciable increase in stage

Card 5/6

4

81811
S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

efficiency of short blades. There are 7 figures, 3 tables and 7 references, 6 of which are Soviet and 1 German.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Institute)

Card 6/6

S/096/60/000/011/017/018
E073/E135

AUTHORS: ~~Deych, M.Ye.,~~ Sherstyuk, A.N., Zaryankin, A.Ye., Zatsepin, M.F., and Frolov, L.B.

TITLE: Investigation of Low Power Radial Turbines

PERIODICAL: Teploenergetika, 1960, No. 11, p 94

TEXT: This is an annotation of a recent research report by MEI. The technique of calculation of radial turbines is considered, giving experimental results on determining the influence of the nozzle system, the outflow angle of the flow α_1 and of the twist of the runner wheel, on the economics of the turbine. An electronic r.p.m. gauge is described. A method is presented of plotting profiles of nozzle systems of radial turbines, their geometrical dimensions and their experimental characteristics, and also data on investigating five runner wheels of various types. A maximum stage efficiency of η_{oi} = 0.32 was obtained. Theoretical considerations are given on calculating the end losses in nozzle lattices with a flow from the centre and towards the centre, and also certain calculations on determining the optimum chord of turbine profiles calculated for subsonic and supersonic flow speeds. There are no figures, tables or references.

Card 1/1

DEYCH, M.Ye., doktor tekhn.nauk, prof.; ZARYANKIN, A.Ye., kand.tekhn.nauk

Determination of optimum width of guide and runner blading in steam turbines. Izv. vys. ucheb. zav.; energ. 3 no. 9:61-67 S '60.
(MIRA 13:9)

1. Moskovskiy ordena Lenina energeticheskiy institut. Predstavlena kafedroy teplotekhniki.
(Steam turbines--Blades)

PHASE I BOOK EXPLOITATION SOV/5995

Deych, Mikhail Yefimovich

Tekhnicheskaya gazodinamika (Engineering Gas Dynamics) 2d ed., rev. Moscow, Gosenergoizdat, 1961. 670 p. Errata slip inserted. 12,000 copies printed.

Ed.: B. Ya. Shumyatskiy, Candidate of Technical Sciences; Tech. Ed.: A. M. Fridkin.

PURPOSE: This textbook is intended for students of heat engineering specialities in power and polytechnic institutes. It may also be useful to scientific workers in laboratories and design bureaus of industrial plants.

COVERAGE: This second, revised edition deals with high-velocity gas dynamics. The first part contains the general theory of one-dimensional and two-dimensional flows. The following chapters contain applications of the general theory, i.e., ~~flow~~ in nozzles, diffusors, ejectors, cascades of blades, and turbine stages. The author acknowledges the help of coworkers of the faculty of steam and gas turbines of the MEI (Moskovskiy energeticheskiy institut -

Card 1/~~8~~ 2

Moscow Power Engineering Institute) in the publication of this edition. Ch. 5 was written jointly with A. Ye. Zaryankin; Chs. 8 and 10 were compiled with the assistance of A. V. Gubarev and F. V. Kazintsev, respectively. The author also received help from the following coworkers of MEI: G. A. Filipkov, A. V. Robozhev, V. G. Filippov, and A. N. Sherstyuk, Docent. Important remarks concerning the editorial work were made by S. F. Abramovich, Doctor of Technical Sciences, Professor. There are 148 references: 138 Soviet, 7 English, 2 German, and 1 Czechoslovak.

TABLE OF CONTENTS [Abridged]:

Card 2/7

25667
S/096/61/000/009/004/008
E194/E155

26.2120

AUTHORS: Deych, M.Ye., Doctor of Technical Sciences, and
Filippov, G.A., Engineer

TITLE: On the design of turbine stages with long blades of variable profile

PERIODICAL: Teploenergetika, 1961, No.9, pp. 60-65

TEXT: In gas turbines and more particular condensing steam turbines, the flow parameters in the later stages vary considerably over the height of the blade. It is important to be able to calculate the various parameters accurately, and although a number of methods have been proposed most of them ignore certain important factors. The object of the present work is to refine the determination of the parameters over the height of the blade by taking account of the following three factors: the slope of the blades; the curvature of the line of flow; and the opening-out of the flow path (its expansion in the meridianal plane). In formulating the equations it is also assumed that flow in the guide vane channels is continuous and that changes in the radial components of velocity along the axes are negligible. Then, with

Card 1/8

the notation used in Fig.1 for section 1 - 1, the equation of radial equilibrium assumes the form:

$$\frac{1}{\rho_1}\cdot\frac{dp_1}{dr_1} = \frac{c_{1u}^2}{r_1} - \frac{c_{1z}^2}{R} - c_{1r}\frac{dc_{1r}}{dr_1} - F_r; \qquad (1)$$ (1)

$$c_{1u} = \sqrt{\frac{c_1^2}{1 + \frac{tg^2\alpha_1}{\cos^2\delta}}}; \quad c_{1z} = \sqrt{\frac{c_1^2 tg^2\alpha_1}{1 + \frac{tg^2\alpha_1}{\cos^2\delta}}};$$

$$c_{1r} = \sqrt{\frac{c_1^2 \sin^2\alpha_1 tg^2\delta}{1 + \sin^2\alpha_1 tg^2\delta}}; \qquad (2)$$ (2)

$$F_r = \frac{F_u}{tg(90 - \gamma)} = c_z \frac{dc_u}{dz\, tg(90 - \gamma)},$$

where: p_1 and ρ_1 are the static pressure and density in the gap; c_{1u}, c_{1z}, c_{1r} are the peripheral axial and radial components of velocity c_1; α_1 is the angle of discharge from the guide vane; δ is the angle of slope of the flow line in the gap; R is the radius of curvature of the flow line in the meridianal plane; F_r, F_u are the radial and peripheral components of force between the blades and the flow; γ is the angle of slope of the blades (see Fig.2). On this figure, the inscription on the left reads "discharge edges of blades". It is assumed that change in c_u across the width of the blade B is linear over the centre line of the channel. The law of change of the radius of curvature of the current lines in the gap may be determined approximately in the general case by solution of the equations of continuity written for three sections; before the guide vanes, in the gap, and beyond the stage. It is shown that for turbine-stages in which c_{1u} is considerably greater than c_{1z} the influence of the curvature of the flow line is important only when R is equal to or less than r. For compressor stages which are not profiled for constant circulation, the curvature of the flow line may have considerable influence on the distribution of parameters over the blade height. Finally, the following expression is obtained for the reaction:

$$\rho = 1 - (1 - \rho_k)\left(\frac{r_{1k}}{r_1}\right)^{2\cos^2\alpha_1} K_1 K_2 K_3 \left(\frac{\varphi_k}{\varphi}\right)^2 \qquad (16)$$

X

where $\varphi = c_1/c_{1t}$;

$K_1 = (1 + \sin^2 \alpha_1 \tan^2 \delta)$ is a coefficient which allows for the influence of expansion of the flow path.

$$K_2 = \left(\frac{r_1 + \sqrt{r^2 - r^2}}{r_{1k} + \sqrt{r_{1k}^2 - r_0^2}} \right)^{2 \sin \alpha_1 \cdot \cos \alpha_1 \cdot \frac{r_0}{B}}$$ is a coefficient which allows for the influence of blade slope.

$$K_3 = \exp \left[\sin^2 \alpha_1 \frac{(r_1 - r_{1k})^2}{R_B l_1} \right]$$ is a coefficient which allows for curvature of the flow lines.

Fig.3 shows graphs of these three correction factors K_1, K_2 and K_3 from which their influence may be assessed. Formula (16) is based on a number of assumptions and no allowance is made for a number of differences between real and ideal flow. Therefore, it is advisable to introduce into formula (16) an experimental coefficient K so that the equation then assumes the following form:

$$\rho = 1 - (1 - \rho_k) \left(\frac{r_{1k}}{r_1} \right)^{K \cdot 2 \cos^2 \alpha_1 \quad K_1 K_2 K_3 \left(\frac{\varphi_k}{\varphi} \right)} \tag{17}$$

The coefficient K depends on many factors and mainly on the gradient of static pressure along the radius and height of the blade. For long blades K is nearly unity, when $d/\ell > 8$, $K \sim 1.3 - 1.4$, and for stages with d/ℓ less than 8, $K = 1.5-1.7$. Further correction in these values may be required when experimental data are accumulated. Values calculated by formula (17) have been compared with experimental data for certain types of stages with meridianal profiling and sloping edges and it will be seen that agreement is particularly good for stages for which $d/\ell > 8.4$. Another important matter is the correct selection of blade twist. The effectiveness of root and peripheral sections of guide and runner blades of stages with low values of d/ℓ is low. Accordingly it is advisable to select the smallest possible discharge angle α_1 in the blade root and peripheral sections, so as to reduce the flow in these sections. In stages with low values of d/ℓ and high super-critical pressure-drops it is of interest to use blades with sloping discharge edges. However, it is not desirable fully to equalise the reaction over the blade height, because it is then practically impossible to achieve axial flow discharge beyond the stage and so the discharge velocity losses rise.

25667

On the design of turbine stages with... S/096/61/000/009/004/008
E194/E155

On the other hand, large angles of slope cause considerable increase in profile losses and losses in peripheral sections. This point is discussed in relation to certain test results. As the angle of slope of the blades is increased, the difference between the reactions at the blade tip and at the root is much reduced. With the particular stage geometry considered, it falls to zero when $\gamma = 25-30^{\circ}$. It is concluded that by allowing for the three factors; curvature of the flow lines, expansion of the flow path and slope of the discharge edges; and also by introducing an experimental coefficient into Eq. (17), the accuracy of calculation of stage parameters with long blades is appreciably increased.
There are 6 figures, 1 table and 4 Soviet references.

ASSOCIATION: Moskovskiy energeticheskiy institut
(Moscow Power Engineering Institute)

Card 6/8

DEYCH, M.Ye., doktor tekhn. nauk, prof.; TROYANOVSKIY, B.M., kand. tekhn. nauk, dotsent; ABRAMOV, V.I., inzh.; KAZINTSEV, F.V., inzh.; KISELEV, L.Ye., inzh.

Studying the partial admission in two-row speed stages. Energomashinostroenie 7 no.3:24-27 Mr '61. (MIRA 16:8)
(Steam turbines—Testing)

DEYCH, M.Ye., doktor tekhn. nauk; FILIPPOV, G.A., kand. tekhn. nauk; ABRAMOV, V.I., inzh.

Study of single-crown stages with partial steam supply. Teploenergetika 10 no.7:16-21 Jl '63. (MIRA 16:7)

1. Moskovskiy energeticheskiy institut.
(Steam turbines) (Gas turbines)

34665

S/114/62/000/001/002/006
E194/E455

26.2122

AUTHORS: Deych, M.Ye., Doctor of Technical Sciences, Professor,
Baranov, V.A., Candidate of Technical Sciences,
Frolov, V.V., Candidate of Technical Sciences,
Filippov, G.A., Engineer

TITLE: The influence of blade height on certain characteristics of single-row turbine stages

PERIODICAL: Energomashinostroyeniye, no.1, 1962, 6-9

TEXT: This article describes work done in the Kafedra parovykh i gazovykh turbin (Steam- and Gas-Turbine Department) of the MEI. The notation used in the article is shown in Fig.1. The stages tested had a mean diameter d_{cp} = 400 mm and the value of the height l_1 ranged from 48 to 10 mm. The clearances had the following values: δ_1, 1.2 to 1.5 mm; δ_2, 3 mm; δ_3, 0.6 to 0.8 mm; δ_4, 1.5 mm. There were no equalizing holes in the disc. The stages were built up by combining a number of different types of runner and nozzle blades so that the effective blade length and other characteristics could be altered. Curves are plotted of stage efficiency and reaction as functions of the velocity ratio of

Card 1/2

u/c_o for stages having different blade lengths. The influence of blade to nozzle area F_2/F_1 on efficiency and the influence of the enclosed axial clearance δ_2 and of the Reynolds number with different blade lengths are also plotted. It is concluded that meridianal profiling of nozzle blading in stages with a height of 10 to 25 mm gives an appreciable increase in stage efficiency, of the order of 2 to 3%. In stages with this kind of profiling, there is almost no difference between the reaction at the blade tip and that at the blade root. When the blades are short, the efficiency falls off more rapidly than is the case with long blades if the velocity ratio is not of the optimum value, within the range of $u/c_o = 0.4$ to 0.58. Other things being equal, the mean stage reaction depends very much on the height of the blades, and it increases as the blades become shorter. When the blades are short the area ratio F_2/F_1 has less influence on the stage efficiency than when they are long. The magnitude of the optimum relative enclosed axial clearance δ_2 diminishes as the blades are shortened. The Reynolds number was found to have an influence on the optimum value of this clearance for stages with short blades. X

32534
S/096/62/000/001/008/008
E194/E995

26.2120

AUTHORS: Deych, M.E., Doctor of Technical Sciences, Professor; Sheynkman, A.G., Engineer

TITLE: Determination of the optimum amount of upper overlap of a shrouded turbine stage

PERIODICAL: Teploenergetika, no.1, 1962, 28-31

TEXT: The existence of upper overlap, by which is meant the amount by which the external diameter of the runner blades exceeds the corresponding diameter of the nozzle blades (or guide vanes) (Δl_n in Fig.1), improves the efficiency of a shrouded stage. There is an optimum amount of upper overlap, and deviation from this optimum may reduce stage efficiency by up to 4%. The Aerodynamics Laboratory of TMZ made tests on an air turbine with a full-sized stage type В -6-3 (VR-6-3), illustrated schematically in Fig.1, for which D_{cp2} = 614.8 mm, and l_2 = 41.1 mm. The axial clearance was varied from 1 to 3 mm and the radial clearance from 1 to 4.5 mm. The upper overlap was altered from 0 to 5 mm by fitting pieces in the nozzle boxes. The tests were made at M_1 = 0.3; Re_1 = 4 x 10^5. The optimum velocity ratio

Card 1/3

X

u/c_0 = 0.49 - 0.[illegible]. The graph of Fig.4 plots deviation from the optimum efficiency (on the y axis) against excursions from the optimum upper overlap, and shows that insufficient overlap is generally more harmful than a corresponding excursion above the optimum. It is considered that acceptable manufacturing tolerances on the optimum overlap are: when overlap $\Delta l_n \leq$ [illegible] mm, a tolerance of -25% and +50%; when $\Delta l_n > 3$ mm, a tolerance of -1 mm and +1.5 mm. To determine the optimum amount of upper overlap of a shrouded turbine stage when (with a notation of Fig.1) $D_{cp1}/l_1 > 15$, $M_1 <$ [illegible] $\rho_n < 0.6$, [illegible] $<$ [illegible] the following formula is recommended:

$$(\Delta l_n)_{opt} = 0.7 \frac{\rho_1^{\frac{1}{4}}}{[illegible]\,\rho} \; [illegible] \qquad [illegible]$$

where

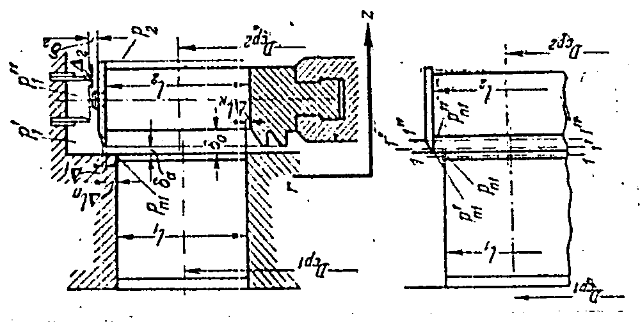
$$\delta_{eq} = \frac{[illegible]}{1 [illegible] n [illegible]} \qquad [illegible]$$

13

Determination of the optimum ... S/096/62/000/001/003/008
E194/E955

There are 4 figures, 1 table and 8 Soviet-bloc references.

ASSOCIATION: MEI Ural'skiy turbomotornyy zavod
(MEI and Ural Turbine Engine Works)



Card 3/4 3

Fig.1.

S/096/62/000/003/001/008
E194/E455

AUTHORS: Shcheglyayev, A.V., Corresponding Member of the AS USSR, Deych, M.Ye., Doctor of Technical Sciences, Professor, Filippov, G.A., Candidate of Technical Sciences

TITLE: The design of steam turbine stages, from the results of static blowing tests on rows of blades

PERIODICAL: Teploenergetika, no.3, 1962, 14-18

TEXT: Two methods are in common use for designing the flow paths of steam turbines. One is based on the use of generalized graphs obtained from the tests on stages. With this method the calculations are simple and reliable for the given type of blading, and various generalized graphs have been produced. The second is based on the use of the energy loss factor and flow factors in guide and runner blades, either derived from static tests or calculated from the velocity triangle. This method is also useful, particularly with new types of blade. A wealth of test results is now being obtained on blades in straight bundles, giving both a qualitative view of the flow structure in various kinds of blading and quantitative characteristics for loss, angles and flow

Card 1/4

factors. An atlas of rational blade profiles has been built up from these tests. Over a number of years, the Kafedra parovykh i gazovykh turbin (Department of Steam and Gas Turbines) of MEI has made studies of flow in turbine blades, using both flat bundles and annular stationary models. Moreover, the blades tested were run in experimental turbines to obtain relationships between efficiency and velocity ratio, using both superheated steam and air. The results so obtained can bridge the gap between the losses determined in static tests and the efficiency of actual stages running on steam. A number of loss curves obtained with various kinds of stage with different kinds of test are plotted and compared, and results are also given for a section of a turbine consisting of three stages. The results lead to the following conclusions. When the design of single-row stages is based on the results of static blowing tests on flat bundles of blades with an irregular velocity distribution and in the presence of overlap, there is satisfactory agreement with tests in experimental turbines in the region of low velocity ratio u/c_o. For optimum values of u/c_o the divergence between test and calculated values is 1.5 to 3%. Generally, a satisfactorily reliable result can be obtained by multiplying the calculated efficiency by a correction factor of 0.98 to 0.97. When calculating the stage efficiency from the loss factors given in the atlas of blade profiles, the correction factor is 0.97 to 0.95 in the zone of optimum velocity ratio. For wheels with two rows of blades the correction factor is 0.97 to 0.95 when the calculations are made from tests carried out with allowance for irregularity of velocity distribution and for overlaps. When the loss factors given in the atlas are used, the correction factor should be 0.95 to 0.92. The least divergence between test and calculated data is obtained in stages with long blades, which indicates that end losses in the blades are not being sufficiently allowed for. Correction factors for relating the result of tests on stages in experimental turbines to calculated values from static blowing tests are valid for stages manufactured with welded diaphragms. The results given in this article are only a first step in relating the results of static tests to total losses determined in an experimental turbine. Further material must be

The design of steam turbine ... S/096/62/000/003/001/008
E194/E455

accumulated to improve the reliability of turbine stage calculations. There are 7 figures and 1 table.

Card 4/4

DEYCH, M.Ye., doktor tekhn.nauk, prof.; GUBAREV, A.V., kand.tekhn.nauk; FILIPPOV, G.A., inzh.; VAN CHZHUN-TSI [Wang Chung-ch'i]

New method for profiling the guiding lattices of stages with low d/l ratio. Teploenergetika 9 no.8:42-47 Ag '62. (MIRA 15:7)

1. Moskovskiy energeticheskiy institut.
(Turbines)

DEYCH, M.Ye., doktor tekhn.nauk; GUBAREV, A.V., kand.tekhn.nauk; LAZAREV, L.Ya., inzh.; DZHAGANMAKHAN, A., inzh.

Investigating the new turbine blade cascade nozzle developed by the Moscow Power Engineering Institute for supersonic speeds. Teploenergetika 9 no.10:47-52 O '62. (MIRA 15:9)

1. Moskovskiy energeticheskiy institut.
(Turbines--Blades) (Nozzles)

S/096/63/000/001/002/006
E194/E155

AUTHORS: Deych, M.Ye., Doctor of Technical Sciences, and Sheynkman, A.G., Engineer

TITLE: An investigation of rotating regulating diaphragms for the district-heating tappings of 25 - 100 MW turbines

PERIODICAL: Teploenergetika, no.1, 1963, 14-21

TEXT: Regulating diaphragms are used to control the steam flow to the l.p. cylinder, and hence the pressure in the district-heating tapping. Two types are distinguished: 'unseparated', in which the complete first ring of blades rotates about its axis, the flat discharge edges of the blade remaining in contact with the flat inlet edges of the second row; and 'separated', in which each blade of the first ring rotates about its own axis whilst its discharge tip remains in contact with the inlet tip of the corresponding blade of the second row. These regulating diaphragms are much simpler than the usual valves, but experimental data for their design is inadequate. Accordingly, flow in the ducts and the influence of various design features on diaphragm operation was investigated, using an optical shadow technique to study flow

Card 1/4

irregularities that might lead to vibration. The type of flow in the diaphragm ducts was found to depend on the ratio between the inlet and discharge sections. In the fully-open position, bands of low and high pressure typical of supersonic speeds were observed. At partial openings considerable swirl was caused behind the blades of the second row but the discharge flow was straight. The discharge angle increases as the aperture is reduced. The optically-observed results were confirmed by discharge speed measurements. Losses in the regulating diaphragm are particularly high when it is nearly closed because of vortex formation and pressure jumps in the duct. The direction of closing influences the velocity distribution and flow angles. It was found that the 'separated' construction could be as efficient as the 'unseparated' in the fully-opened position; in the partially-opened position the discharge velocity distribution was more uniform but the losses were greater because the ducts are longer and flow conditions over the curved surfaces are poor. Therefore, the question of using a 'separated' diaphragm is mainly a question of diaphragm width. The main object should be to obtain minimum

losses and straight flow throughout the discharge section. After further discussion of the experimental results it is concluded that in designing these diaphragms: the number of throttle ducts should be the same as the number of blade channels; 'unseparated' construction is preferred; a sloping inlet is preferred with an angle of 60-70°; but if inlet is axial, the nozzle duct length at the centre line should be greater than with the sloping inlet, to reduce the relative curvature of the concave surface; and, finally, the inlet edges of the first ring blades should be rounded instead of the more usual conical shape. Recommendations are also made about blading types. A low-pressure regulating diaphragm on these lines is as efficient as one with the usual nozzle arrangement in the fully-opened position. Tests on regulating gear for turbines of 50 - 100 MW confirmed figures obtained by the simple design formula recommended. It is shown that total losses in the flow-regulating equipment depend both on the degree of opening and on the operating conditions, and characteristic curves are constructed to illustrate this point.
There are 8 figures.

An investigation of rotating ... S/096/63/000/001/002/006
E194/E155

ASSOCIATION: Moskovskiy energeticheskiy institut
(Moscow Power Engineering Institute)

Ural'skiy turbomotornyy zavod
(Ural Turbine Works)

Card 4/4

DEYCH, M. Ye., doktor tekhn. nauk, prof.; FILIPPOV, G.A., kand. tekhn. nauk

Study of turbine stages with annular diffusers. Teploenergetika 10 no.10:18-23 O '63 (MIRA 17:7)

1. Moskovskiy energeticheskiy institut.

ACCESSION NR: AP4014406 S/0143/63/000/012/0064/0072

AUTHOR: Deych, M. Ye. (Doctor of technical sciences, Professor); Zaryankin, A. Ye. (Candidate of technical sciences); Mikhnenkov, L. V. (Engineer); Frolov, L. B. (Engineer)

TITLE: Effect of throttling ring on the operation of a radial-axial turbine

SOURCE: IVUZ. Energetika, no. 12, 1963, 64-72

TOPIC TAGS: turbine, radial axial turbine, turbine power control, throttling turbine control, throttling ring turbine control

ABSTRACT: Controlling turbine power by the introduction of a throttling ring between the nozzle-box assembly and the rotor was experimentally investigated. A turbine described by A. Ye. Zaryankin, et al. (IVUZ. Energetika, no. 8, 1961) was used at 1.82 pressure drop and 0.17, 0.282, and 0.47 relative ring throttling. At 47% throttling, the turbine efficiency was 15% lower. The

ACCESSION NR: AP4014406

theoretical explanation of losses associated with this type of throttling is given in the article. The above-described "attempt to throttle the flow in the gap between the nozzle box and the rotor did not yield favorable results .... and can be recommended for cases where reliable control devices of minimum size are required. The last requirement may prove decisive in transportation plants...." Orig. art. has: 7 figures and 13 formulas.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power-Engineering Institute)

SUBMITTED: 19Jun63 DATE ACQ: 14Feb64 ENCL: 00

SUB CODE: PR, AP NO REF SOV: 005 OTHER: 000

Card 2/2

ACCESSION NR: AR4015128 S/0124/63/000/012/B042/B042

SOURCE: RZh. Mekhanika, Abs. 12B237

AUTHOR: Deych, M.Ye.; Lazarev, L.Ya.

TITLE: New supersonic nozzle grates from the Moscow River Engineering Institute

CITED SOURCE: Tr. Mosk. energ. in-ta, vy*p. 47, 1963, 5-16

TOPIC TAGS: supersonic flow, nozzle grate, gas dynamics

TRANSLATION: The authors describe an empirical method of constructing supersonic nozzle grates. They give formulas for determining the basic geometric dimensions of these grates and describe the results of experiments on several grates constructed by the suggested method. The grates studied differ from those employed earlier in the authors' studies by a smaller variation of the loss coefficient in uncomputed states. The proposed grates have longer interblade channels than those constructed by the method of characteristics with an angle point in a narrow cross-section (Ferry, A., Aerodynamics of Supersonic Flow, Gostokhizdat, 1952, pages 176-184). V.V. Gol'tsev.

DATE ACQ: 31Dec63 SUB CODE: PH ENCL: 00

Card 1/1

DEYCH, M.Ye.; SHEYNKMAN, A.G.

New nozzle blade profiles regulating the rotational diaphragms of bleed turbines. Trudy MEI no.47:37-48 '63. (MIRA 17:1)

DEYCH, M.Ye.; STEKOL'SHCHIKOV, Ye.; SHKARLET, Yu.; ZHELUDOV, V.;
PRYAKHIN, V.

Automation of static tests in studying aerodynamic cascades of profiles. Trudy MEI no.49:38-53 '63. (MIRA 17:3)

L 16480-65 EWP(f)/T-2/EPA(bb)-2 ASD(p)-3/AFTC(a)
ACCESSION NR AM4045987 BOOK EXPLOITATION S/

B+1

Deych, M. YE.; Troyanovskiy, B. M.

Investigation and calculation of stages in axial turbines (Issledovaniya i raschety" stupeney osevy*kh turbin), Moscow, Izd-vo "Mashinostroyeniye", 1964, 627 p. illus., biblio. Errata slip inserted. 3,000 copies printed.

TOPIC TAGS: axial turbine

PURPOSE AND COVERAGE: The book examines methods and results of experimental investigation of turbine lattices and stages, methods of thermal and aerodynamic calculation, and design of stages with axial gas (steam) flow. Great attention is given to regulation stages of various types and the intermediate and final stages of gas and steam turbines. The effect of moisture on the through stage is considered. The book contains the results of research conducted at MEI and other organizations in the Soviet Union and abroad. The book is intended for a wide circle of power engineers working with steam and gas turbines. For many problems it will also be of interest for researchers and engineers interested in transportation and aviation turbines. The book can be useful to advanced students of power engineering and polytechnic institutes.

Card 1/2

L 16480-65
ACCESSION NR AM4045987

TABLE OF CONTENTS [abridged]:

SUB CODE: EE, PR SUBMITTED: 20Dec63 NR REF SOV: 128
OTHER: 035

Card 2/2

ACCESSION NR: AP4024449 S/0281/64/000/001/0109/0115

AUTHOR: Deych, M. Ye. (Moscow); Likherzak, Ye. Ye. (Moscow)

TITLE: Turbulent effects in a turbine stage

SOURCE: AN SSSR. Izv. Energetika i transport, no. 1, 1964, 109-115

TOPIC TAGS: turbulent effect, turbine flow, stagnation temperature, axial vane grid, radial derivative, axial derivative

ABSTRACT: Experimental and calculated relationships characterizing the uneven distribution of stagnation temperatures in the viscous gas behind the vane grid of a turbine are presented. Evaluation of turbulent effects in a turbine is carried out to achieve better understanding of the actual structure (thermal and dynamic) of turbine flow. Two related problems arise in calculation of the uneven distribution of stagnation temperatures through the radius of a stage. The first problem is that of determining the method of calculation, permitting an approximation of the magnitude of the specified nonuniformity which is dependent on basic modes and geometrical parameters of a stage. The second is the insertion of related correction into the aerodynamic calculation of flow turbulence. By experimenting, several preliminary appraisals of the energy distribution behind the axial-type vane grid are

Card 1/2

ACCESSION NR: AP4024449

made. The current in the ring duct behind the grid is assumed to be stabilized, two-dimensional (radial velocity component $c_r = 0$) and axially symmetrical. Derivatives in the axial direction are omitted, when compared to derivatives in the radial direction. The current in this grid is assumed to be adiabatic, and radial parameters in front of the grid - uniform. In conclusion, the authors note that the method proposed for evaluating stagnation temperature inhomogeneity in the nozzle grid is entirely approximate and its error must be tested thoroughly with experiments. When experimenting with grids and high-spin stages with large M numbers, it is necessary to measure the stagnation temperature in the gap and behind the stage. Accumulation of experimental material will permit determining the degree of effect of these or other structural and gas dynamic factors on the effect of uneven temperature distribution.

ASSOCIATION: none

SUBMITTED: 15Apr63 DATE ACQ: 16Apr64 ENCL: 00

SUB CODE: AI, PR NO REF SOV: 004 OTHER: 004

Card 2/2

ACCESSION NR: AP4012338 S/0096/64/000/002/0018/0024

AUTHORS: Deych, M. Ye. (Doctor of technical sciences); Stekol'shchikov, Ye. V. (Engineer); ~~Filippov, G. A.~~ (Candidate of technical sciences)

TITLE: On pressure measuring tubes in pulsating gaseous flows

SOURCE: Teploenergetika, no. 2, 1964, 18-24

TOPIC TAGS: turbulent stream, error analysis, flow oscillation, auxiliary element, pitot tube, total pressure, friction, heat transfer

ABSTRACT: Error sources of pressure measuring tubes in turbulent streams were discussed analytically. The error analysis is represented as the sum of dynamic error ξ_D independent of flow oscillation frequency and geometry of the measuring system, and the dynamic error by ξ_A of auxiliary elements of the pressure measuring device. The latter in turn is divided into three subdivisions: error in the incoming branch of the system ξ_{in}, errors in the main line ξ_m, and errors in the manometer itself. The analysis of ξ_D is illustrated by means of a pitot tube which leads to an expression of the form

Card 1/2

ACCESSION NR: AP4012338

$$\xi_{n.м} = \left[\frac{\bar{p}_0 - \bar{p}'_0}{\left(\rho_\infty \frac{c_2^2}{2}\right)_p}\right] \cdot 100\%,$$

where $\bar{p}_o$ - total pressure and $\bar{p}'_o$ - mean pitot pressure per period T. The incoming branch error, ξ_{in}, is represented in a similar form where $\bar{p}'_o$ is the stagnation pressure including nonlinear field deformations. The main line error ξ_m is shown to be the sum of losses due to friction, heat transfer and local resistance, normally not accounted for in flow pressure measuring devices. The manometer error is estimated from mass inertia considerations. It is shown that the combined effect of these errors might lead to discrepancies in flow measurements by as much as 200%. Orig. art. has: 33 formulas, 8 figures, and 1 table.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute)

SUBMITTED: 00 ENCL: 00

SUB CODE: ME NO REF SOV: 003 OTHER: 000

Card 2/2

ACCESSION NR: AP4038658 S/0170/64/000/004/0018/0024

AUTHOR: Deych, M. Ye.; Lazarev, L. Ya.

TITLE: Investigation of the transition of a turbulent into a laminar boundary layer

SOURCE: Inzhenerno-fizicheskiy zhurnal, no. 4, 1964, 18-24

TOPIC TAGS: Turbulent boundary layer, laminar boundary layer, turbulent flow, laminar flow

ABSTRACT: Experimental investigations of a boundary layer on different models confirmed the transition of a turbulent boundary layer into a laminar one, i.e., a "reverse transition" of great positive longitudinal velocity. Maximum positive velocity gradients must meet the transonic gas flow. Consequently, transition through the sonic velocity in convergent-channel flow is always associated with a degeneration of turbulence and the linearization of the core flow and of the boundary layer. This phenomenon (reverse transition) should be considered a very important feature of the transonic flow of a viscous gas. The experiments showed that the transition of a turbulent boundary layer occurs

ACCESSION NR: AP4038658

gradually over a considerable "transition" portion. According to preliminary data, the distance at which a "reverse" transition occurs is of the order of 15-25 δ, where δ is the thickness of the boundary layer at the start of the transition zone. However, the length of the transition zone should depend on the value of the velocity gradient. Orig. art. has 5 figures.

ASSOCIATION: Energeticheskiy institut, Moscow (Power Engineering Institute)

SUBMITTED: 11Mar63 DATE ACQ: 19May64 ENCL: 00

SUB CODE: ME NO REF SOV: 004 OTHER: 006

Card 2/2

ACCESSION NR: AP4041175 S/0096/64/000/007/0074/0078

AUTHORS: Deych, M. Ye (Doctor of technical sciences, Professor); Filippov, G. A. (Candidate of technical sciences); Nauman, V. (Engineer)

TITLE: Lemniscate method for constructing profiles of subsonic lattices

SOURCE: Teploenergetika, no. 7, 1964, 74-78

TOPIC TAGS: turbine, turbine lattice, lemniscate profile, turbine blade profile, turbine characteristic, turbine loss, turbine design

ABSTRACT: A method using lemniscate curves for constructing profiles of reactive and active lattices of subsonic turbines was studied because other profiling methods are difficult. New profiles may be constructed from a series of lattices by making small changes in the geometry at the entrance and exit cross sections of two closely similar profiles. Experiments showed that this method produced highly efficient profiles for directional and working lattices over a broad range of entrance and exit angles for subsonic speeds. The lemniscate $(x^2 + y^2)^2 = a^2(x^2 - y^2)$ was found to be most favorable because it permits the choice of

ACCESSION NR: AP4041175

the point of maximum curvature and insures smoothly changing curvatures. Changing the ordinate scale ($y' = k_y y$) shifts the highest point of the profile back along the line $x = 0.625a$ and produces the desired form for any angle of entry and exit. The flow at the concave surface takes place with negative pressure gradients, and the concave surfaces under the negative pressure gradients need be less accurately profiled, so curves other than lemniscate may be used. The profile is considered in three sections: 1) the back of the profile—a straight line in two lemniscate sections; 2) the concave surface—an arc, in part a lemniscate; 3) the entrance and exit sections of the profile—arcs of circles. To construct a profile, the entrance angle α_0 (β_1) and exit angle α_{1ef} (β_{2ef}), the span or width of the profile, and the speed are needed. As an example a ten-step profile construction is presented, with the lemniscate method used for constructing profiles and canals of lattices for an exit angle α_1 (β_2) = 10, 15, 22, 30, and 40° with entrance angle α_0 (β_1) = 20-160°. The change in form of a profile with a fixed entrance angle, $\alpha_0 = 90°$ and with changing exit angles was shown. Four profiles with $\alpha_0 = 90°$ and α_1 = 10, 15, 20, and 40° were tested. The profile losses and

Card 2/3

ACCESSION NR: AP4041175

total losses were found as a function of the Mach number and pressure distributions along the profiles were plotted. A comparison of the new profiles with the best of previously studied and tested ones indicated small losses in the lemniscate lattices for a broad range of exit and entrance angles. With small corrections the lemniscate method may be used for constructing long curved blades. Orig. art. has: 6 figures and 2 tables.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute)

SUBMITTED: 00 ENCL: 00

SUB CODE: PR NO REF SOV: 003 OTHER: 000

Card 3/3

DEYCH, M.Ye.; TSIKLAURI, G.V.

Supercooling and structure of a stream of wet steam escaping from a tapering nozzle. Teplofiz. vys. temp. 2 no.3:454-463 My-Je '64. (MIRA 17:8)

1. Moskovskiy energeticheskiy institut.

DEYCH, M.Ye., doktor tekhn.nauk, prof.; STEPANCHUK, V.F., dotsent, kand.tekhn. nauk; TSIKLAURI, G.V., inzh.

Distribution of static pressures in the flow of wet steam. Izv. vys. ucheb. zav.; energ. 7 no.8:111-115 Ag '64. (MIRA 17:12)

1. Moskovskiy ordena Lenina energeticheskiy institut.

DEYCH, M.Ye., doktor tekhn. nauk, prof.; FILIPPOV, G.A., kand. tekhn. nauk; BARANOV, V.A., kand. tekhn. nauk; PRYAKHIN, V.V., inzh.; KUSTOV, O.P., inzh.

Effect of humidity on the efficiency of a bandaged and nonbandaged turbine stage. Energomashinostroenie 10 no.8:21-26 Ag '64.
(MIRA 17:11)

S/0096/64/000/008/0033/0036

ACCESSION NR: AP4042618

AUTHORS: Deych, M. Ye. (Doctor of technical sciences, Professor); Filippov, G. A. (Candidate of technical sciences); Stekol'shchikov, Ye. V. (Engineer)

TITLE: Speed of sound in two-phase media

SOURCE: Teploenergetika, no. 8, 1964, 33-36

TOPIC TAGS: two phase medium, steam water, elastic component, elasticity modulus, speed of sound, polytropic process, mean speed ratio, Stokes flow, water droplet, wave front

ABSTRACT: The propagation of disturbances in a two-phase medium has been studied analytically, and the results are compared to values obtained experimentally. Guck's simplified model of a piston applying a force P on a steam-water system is considered, where the steam represents the elastic component of the mixture with elasticity modulus E or $\frac{P}{F}=E\frac{dS}{dz}$, where dS- distance piston moves in time dt, dz- length of gas set into motion by piston. For a water content of 1-x in the steam an expression is then obtained for the speed of sound in a

Card 1/3

ACCESSION NR: AP4042618

polytropic process of index m, or $a=\sqrt{\frac{m\cdot P}{x\rho\left(1+\frac{1-x}{x}\cdot\frac{c_B}{c_\pi}\right)}}$, where C_B/C_π - mean speed ratio of water droplets and steam, ρ- density of water-steam mixture. Furthermore, a formula is arrived at for the mean speed ratio, using Stoke's flow for the spherical water droplets. This yields $\frac{c_B}{(c_\pi)_0}=\frac{\tau_0}{T}\left[e^{-\frac{T}{\tau_0}}+\frac{T}{\tau_0}-1\right]$,

τ_0 - time constant $\tau_0=\frac{2}{9}\frac{\rho_0 r^2}{\mu_\pi}$, T - time during which pressure rises or falls at the wave front. The expression for "a" is then compared to the experimental data obtained at the Moscow Institute of Heat Power in the steam-water region $1>x>1-0.75$ and $T = 10^{-4}$ sec. Water droplets had estimated diameters of 10^{-4} to 10^{-3} cm. Measurement accuracy amounted to $\pm$ 1.5% in the magnitude of "a". Although experimental data cover a very small range, they show a good agreement with the values predicted by the expression for "a" above. Orig. art. has: 14 formulas and 5 figures.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Institute of Heat Power)

2/3

ACCESSION NR: AP4042618

ENCL: 00

SUBMITTED: 00

OTHER: 002

SUB CODE: ME,GP

NO REF SOV: 004

Card 3/3

L 20251-65 EWT(1)/EWP(f)/EWG(s)-2/EWA(v)/EPR/T-2/EPA(bb)-2 Pe-5/Ps-4/Pw-4
AEDC(a)/AEDC(b)/ASD(f)-3/ASD(p)-3/AFTC(a)/AFTC(p) WW

S/0096/64/000/012/0046/0050
ACCESSION NR: AP4049892

AUTHORS: Deych, M. Ye. (Doctor of technical sciences, Professor); Zaryankin, A. Ye. (Candidate of technical sciences); Zatsepin, M. F. (Candidate of technical sciences)

TITLE: Results of experiments on discharge nozzles with oblique sectioned diffusers

SOURCE: Teploenergetika, no. 12, 1964, 46-50

TOPIC TAGS: gas turbine, nozzle design, diffuser design, discharge profile B

ABSTRACT: The characteristics of gas turbine nozzles of different geometric sizes were studied. On the basis of the experimental data, the effects of the relative diameter D/ℓ_1 and the relative spacings ℓ_4/ℓ_1 and ℓ_3/ℓ_1 were investigated and are shown in Fig. 1 on the Enclosure. It was found that, generally, at an assigned value of D/ℓ_1 and fixed value of ℓ_4, a reduction in the length ℓ_3 gave rise to a large increase in the losses. However, in certain regimes this increase was lessened. For small values of D/ℓ_1 there was a region, with the deflector approaching the discharge profile of the diffuser, in which the losses did not increase, but decreased. It was found that at low values of the relative length L/D_H of the exterior cone ($L/D_H < 1$, where D_H is the diameter of the outlet) it was impossible

APPROVED FOR RELEASE: 06/12/2000 CIA-RDP86-00513R000410310015-6"

L 20251-65
ACCESSION NR: AP4049892

to obtain a diffuser section at the optimal angle. Orig. art. has: 6 figures and 1 formula.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute)

SUBMITTED: 00 ENCL: 01

SUB CODE: PR NR REF SOV: 003 OTHER: 000

Card 2/3

L 20251-65
ACCESSION NR: AP4049892 ENCLOSURE: 01

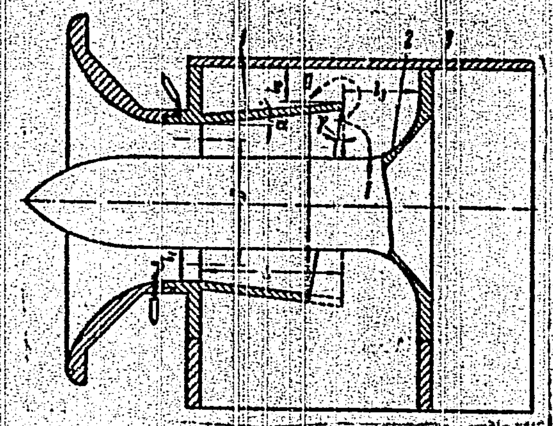


Fig. 1. The discharge nozzle. 1 - oblique sectioned diffuser; 2 - radial rotating deflector; 3 - assembled casing.

Card 5/5

DEYCH, M.Ye., doktor tekhn. nauk; STEKOL'SHCHIKOV, Ye.V., inzh.; FILIPPOV, G.A., kand.tekhn.nauk

Measurements in pulsating gas streams conducted by means of pneumatic caps. Teploenergetika 11 no.2:18-24 F '64. (MIRA 17:4)

1. Moskovskiy energeticheskiy institut.

DEYCH, M.Ye., doktor tekhn. nauk, prof.; FILIPPOV, G.A., kand. tekhn. nauk; NAUMAN, V., inzh.

Lemniscate method for constructing the profiles of subsonic lattices. Teploenergetika 11 no.7:74-78 Jl '64. (MIRA 17:8)

1. Moskovskiy energeticheskiy institut.

L 39483-65 UR/0096/64/000/011/0026/0030

ACCESSION NR: AP5011717

AUTHOR: Deych, M. Ye. (Doctor of technical sciences, Professor); Troyanovskiy, F. B. M. (Candidate of technical sciences); Kiselev, L. Ye. (Engineer); Krupennikov, B. N. (Engineer)

4
B

TITLE: Investigation of an annular turbine grill of large fan shape

SOURCE: Teploenergetika, no. 11, 1964, 26-30

TOPIC TAGS: electric power engineering, power plant component

ABSTRACT: In the Laboratory of Steam and Gas Turbines of the Moscow Power Engineering Institute (MFEI), investigations were made of annular multi-nozzle grills with $d_{cp}/l = 2.5$ at various angles of taper of the peripheral meridian line. The tests were conducted in a circular wind tunnel in air at a maximum subsonic speed of $M = 0.84$. A grill with a variable chord and $\bar{t}$ = const proved to be highly effective (up to $M = 0.86$) during the regimes considered. Separation of flow was not observed in any of the grills, which differs from Bammert's conclusions [K. Bammert, H. Klaeukens, Ingenieur-Archiv, Bd XVII, 1949]. This confirms the explanation by the present writers of the separation in certain annular grills, by the flow

Card 1/2

APPROVED FOR RELEASE: 06/12/2000 CIA-RDP86-00513R000410310015-6"

L 39483-65
ACCESSION NR: AP5011717

0

in the root zone -- by the presence in it of diffusion sections. Down to the angle of opening of the peripherial line $\gamma_p = 32^o$, the losses in the grill proved to be small, which is explained by the optimum grill configuration with respect to height (l = const, b = var) and the high effectiveness of the initial grill TS-IA MPEI. The tests showed a large divergence in the distributed parameters of the flow with respect to height in comparison with the most prevalent calculation with a simplified Euler formula. The method of calculation used provides satisfactory conformity with the experimental results. Orig. art. has: 7 formulas, 1 figure, and 6 graphs.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute)

SUBMITTED: 00 ENCL: 00 SUB CODE: EE

NO REF SOV: 004 OTHER: 001 JPRS

Card 2/2 *ba*

DEYCH, M.Ye.; STEPANCHUK, V.F.; SALTANOV, G.A.; TSIKLAURI, G.V.

Experimental study of condensation jumps. Teplofiz. vys. temp. 2 no.5:789-796 S-O '64. (MIRA 17:11)

1. Moskovskiy energeticheskiy institut.

DEYCH, M.Ye., doktor tekhn. nauk; FILIPPOV, G.A., kand. tekhn. nauk; PRYAKHIN, V.V., inzh.

Calculation of the efficiency of stages operating on wet steam. Teploenergetika 11 no.10:47-50 O '64. (MIRA 18:3)

1. Moskovskiy energeticheskiy institut.

DEYCH, M.Ye., doktor tekhn. nauk, prof.; TROYANOVSKIY, B.M., kand. tekhn. nauk; KISELEV, L.Ye., inzh.; KRUPENNIKOV, B.N., inzh.

Study of an annular large-fan turbine cascade. Teploenergetika 11 no.11:26-30 N '64. (MIRA 17:12)

1. Moskovskiy energeticheskiy institut.

DEYCH, M. Ye., doktor tekhn. nauk, prof.; ZARYANKIN, A. Ye., kand. tekhn. nauk; ZATSEPIN, M.F., kand. tekhn. nauk

Results of the tests of exhaust outlets with obliquely cut diffusers. Teploenergetika 11 no.12:46-50 D '64
(MIRA 18:2)

1. Moskovskiy energeticheskiy institut.

ALEKSANDROVA, M.A.; ASINOVSKIY, E.I.; BALANDIN, V.V.; BRODYANSKIY, V.M., kand. tekhn. nauk; VAKHRAMEYEVA, Ye.A.; VERBA, M.I., kand. tekhn. nauk; VORONIN, T.A., kand. tekhn. nauk; GIRSHFEL'D, V.Ya., kand. tekhn. nauk; DEYCH, M.Ye., prof. doktor tekhn. nauk; IVIN, F.A.; LAPSHIN, M.I., kand. tekhn. nauk; LIPOV, Yu.M., kand. tekhn. nauk; LYUBARSKAYA, A.F.; MAKARENKO, I.D.; MIRIMOVA, V.M.; NEVLER, S.Ye.; ROZANOV, K.A., kand. tekhn. nauk; ROTACH, V.Ya., kand. tekhn. nauk; KHMEL'NITSKIY, R.Z., kand. tekhn. nauk; SHEVCHENKO, E.G.; BOGOMOLOV, B.A., red.; VAYNSHTEYN, K.N., spets. red.; LICHAK, S.K., spets. red.

[German-Russian heat engineering dictionary] Nemetsko-russkii teplotekhnicheskii slovar'. Moskva, Sovetskaia entsiklopediia, 1964. 512 p. (MIRA 18:1)

1. Moscow. Energeticheskiy institut. 2. Moskovskiy energeticheskiy institut (for all except Vaynshteyn, Lichak).

DEYCH, M.Ye. (Moskva); STEPANCHUK, V.F. (Moskva); SALTANOV, G.A. (Moskva); TSIKLAURI, G.V. (Moskva)

Experimental study of rapid condensation changes in an axisymmetrical accelerating flow of water vapor. Izv. AN SSSR.Energ. i transp. no.1:122-128 Ja-F '65. (MIRA 18:4)

DEYCH, M.Ye., doktor tekhn. nauk; FILIPPOV, G.A., kand. tekhn. nauk; LAZAREV, L.Ya., inzh.; KAZANDZHAN, P.K., doktor tekhn. nauk, prof., retsenzent

[Atlas of the profiles of the cascades of axial-flow turbines] Atlas profilei reshetok osevykh turbin. Moskva, Mashinostroenie, 1965. 96 p. (MIRA 18:2)

L 35458-65 EWP(m)/EWT(1)/FCS(k)/EWA(d)/EWA(1) Pd-1 WW

ACCESSION NR: AP5007799 S/0281/65/000/001/0122/0128

AUTHOR: Daych, M. Ye.; Stepanchuk, V. V.; Saltanov, G. A.; Tsiklauri, G. V.

TITLE: Experimental studies of condensation discontinuities within an axially symmetric water vapor flow

SOURCE: AN SSSR. Izvestiya. Energetika i transport, no. 1, 1965, 122-128

TOPIC TAGS: condensation discontinuity, nozzle flow, supersonic vapor flow, water vapor flow, supercooled vapor flow, Laval nozzle

ABSTRACT: The study of high-velocity vapor flows in the presence of phase transitions is of great importance for the theory of steam turbines, atomic power engineering, etc. The present investigation is a continuation of previously published works (Izv. AN SSSR, Energetika i transport, 1964, no. 3; Teplofizika vysokikh temperatur, 1964, no. 3; Ibid., 1964, no. 5) carried out at the Kafedra parovykh i gazovykh turbin (Department of vapor and gas turbines) of the MEI. The same references describe the experimental equipment and procedures used for the subsequent experimental studies of condensation discontinuities within the free flow following the cross-section of tapered nozzles and within the widening portion of the Laval nozzle. Results within the nozzle flow of humid vapor showed that:

Card 1/2

L 35458-65

ACCESSION NR: AP5007799

1) condensation discontinuities appearing within the free supersonic flow and in the widening portion of the Laval nozzle modify the structure of the flow in an essential way; namely, behind the condensation discontinuity, one observes a weakening and even disappearance of the pressure discontinuity, thus modifying the operating mode of the Laval nozzle; 2) the location of the condensation discontinuity depends on the overheating factor and the time interval needed for the vapor to expand from the upper boundary curve to the discontinuity, and 3) the maximum supercooling is a single-valued function of the time of expansion of the supercooled vapor. The authors supply appropriate empirical equations. Orig. art. has: 4 formulas and 7 figures.

ASSOCIATION: none

SUBMITTED: 04Jun64 ENCL: 00 SUB CODE: ME

NO REF SOV: 004 OTHER: 006

Card 2/2

L 52316-65 EPR/EWG(v)/EWA(1)/EWG(s)-2/EWP(k)/EWT(d)/EWT(1)/EWT(m)/EPA(bb)-2/ T-2/EWP(v)/EWP(v) Pe-5/Pf-4/Ps-4/Peb/Pw-4 WW/EM

ACCESSION NR: AP5011773 UR/0096/65/000/005/0040/0044

AUTHORS: Deych, M. Ye. (Doctor of technical sciences, Professor); Zaryankin, A. Ye. (Candidate of technical sciences); Zatsepin, M. F. (Candidate of technical sciences)

56
55
B

TITLE: Results of experiments on exhaust nozzles of turbomachinery with annular diffusers

SOURCE: Teploenergetika, no. 5, 1965, 40-44

TOPIC TAGS: nozzle, turbomachinery, diffuser, exhaust nozzle, Mach number, Reynolds number

ABSTRACT: The results of experiments on a series of exhaust nozzles of gas turbines are presented, and the influence of the various geometric parameters on the magnitude of losses is discussed. A typical design of the nozzle is shown in Fig. 1 on the Enclosure. Here, 1 is a nozzle diffuser, 2 is the deflector, and 3 is the jacket assembly. In these experiments the size of D/l_1 was varied from 4 to 10, l_3/l_1 was varied from 1 to 7, L/l_1 from 4.7 to 8, the Mach number M from 0.15 to 0.6, Reynolds number from 0.5×10^5 to 3×10^5, and

Card 1/3

L 52316-65

ACCESSION NR: AP5011773

$n = F_2/F_1$ from 2.3 to 2.6. The diffuser losses first decreased as l_3/l_1 was increased from 1 to 2. Then they started to increase, reaching a maximum around 3.5, and then decreased again until l_3/l_1 = 7. The losses increased monotonically with D/l_1 and also with Mach number. Orig. art. has: 6 figures and 1 table.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute)

SUBMITTED: 00 ENCL: 01 SUB CODE: PR

NO REF SOV: 003 OTHER: 000

Card 2/3